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ABSTRACT

The Comprehensive School Mathematics Program (CSMP) is a program of CEMREL, Inc., one of the national educational laboratories and is funded by the National Institute of Education. Its major purpose is the development of curriculum materials in mathematics for grades K-6. Beginning in September, 1973, CSMP began an extended pilot trial of its Elementary Program. This report is an attempt to summarize, in a reasonably non-technical way, the information collected during the first year of the evaluation. Included are: (1) descriptions of trial sites; (2) results of test data including standard content, cognitive skills, and CSMP content; (3) teacher reactions to CSMP; (4) costs; (5) external review; (6) school decisions regarding continued use; and (7) a discussion of the pilot trial. (RH)

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EXTENDED PILOT TRIALS OF THE COMPREHENSIVE SCHOOL MATHEMATICS PROGRAM:

EVALUATION REPORT SERIES

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Evaluation Report I-A-3

Final Summary Report
Year 1

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Extended Pilot Trial of the Comprehensive School Mathematics Program

Evaluation Report 1-A-3

FINAL SUMMARY REPORT
YEAR 1

Martin Herbert

November 1, 1974

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Description of Evaluation Report Series

The Comprehensive School Mathematics Program (CSMP) is a program of CEMREL, Inc., one of the national educational laboratories, and is funded by the National Institute of Education. Its major purpose is the development of curriculum materials in mathematics for grades K-6.

Beginning in September, 1973, CSMP began an extended pilot trial of its Elementary Program. The pilot trial is longitudinal in nature; students who began using CSMP materials in kindergarten or first grade in 1973-74 will use them in first and second grade respectively in 1974-75 and in second and third grade the following year. Hence the adjective "extended." The limited scope of these trials does not justify the term "field trial" since the major focus of the evaluation is on a limited number of classes in the metropolitan St. Louis area.

The evaluation of the program in this extended pilot trial is intended to be reasonably comprehensive and to supply information desired by a wide variety of audiences. For that reason the reports in this series are reasonably non-technical and do not attempt to widely explore some of the related research issues. The list of reports from the first year of the extended pilot trial is given on the next page. The most comprehensive of these are 1-A-1: Overview, Design and Instrumentation and 1-A-3: Final Summary Report, Year 1. The former will be particularly useful to the reader in providing a description of the program, the philosophy and goals of the evaluation and the relationship of individual reports to the evaluation effort as a whole.

Longitudinal Pilot Study of the
Comprehensive School Mathematics Program

Evaluation Report Series

Evaluation Report 1-A-1	Overview, Design and Instrumentation
Evaluation Report 1-A-2	External Review of CSMP Materials
Evaluation Report 1-A-3	Final Summary Report Year 1
Evaluation Report 1-A-4	Untitled Theoretical Paper(s)
Evaluation Report 1-B-1	Mid-Year Test Data: CSMP First Grade Content
Evaluation Report 1-B-2	End-of-Year Test Data: CSMP First Grade Content
Evaluation Report 1-B-3	End-of-Year Test Data: Standard First Grade Content
Evaluation Report 1-B-4	End-of-Year Test Data: CSMP Kindergarten Content
Evaluation Report 1-B-5	Test Data on Some General Cognitive Skills Related to CSMP Content
Evaluation Report 1-B-6	Summary Test Data: Detroit Schools
Evaluation Report 1-C-1	Teacher Training Report
Evaluation Report 1-C-2	Observations of CSMP First Grade Classes
Evaluation Report 1-C-3	Mid-Year Data from Teacher Questionnaires
Evaluation Report 1-C-4	End-of-Year Data from Teacher Questionnaries
Evaluation Report 1-C-5	Interviews with CSMP Kindergarten Teachers
Evaluation Report 1-C-6	Analysis of Teacher Logs
Evaluation Report 1-C-7	Student Attitude Data, First Grade

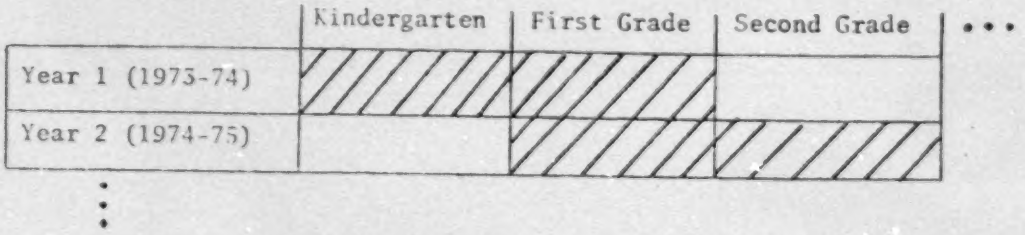
Key to Indexing

1-C-2 Observations of CSMP First Grade Classes

"2" refers simply to the number within a given year and type of data

"C" refers to the type of data being reported
- A: Overview, summary and theoretical reports
- B: Student outcomes
- C: Non-test data

"1" refers to the year of the Pilot Study according to the following:



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Introduction

In the fall of 1973, kindergarten and first grade materials of the Comprehensive School Mathematics Program began being used in over 100 classes as part of CSMP's Extended Pilot Test. This Pilot Test is longitudinal in nature; most kindergarten and first grade classes beginning the program in 1973-74 are continuing with first and second grade materials in 1974-75.

During the first year of this Pilot Trial a considerable amount of information was collected about the program, how it was being used and with what results. The list of Evaluation Reports on page iv will give the reader some idea of the variety of evaluation tasks carried out. With the exception of the first report, 1-A-1, each report deals with a specific issue or set of data. Report 1-A-1 is intended to be an introduction to the series and describes the program in terms of its content and materials and its history, the general and specific objectives of this summative evaluation, and the setting and design of the Pilot Trial.

The present report is an attempt to summarize, in a reasonably non-technical way, the information collected during this past year. While it is not possible, nor necessarily desirable, to suppress the opinions and prejudices of the evaluator, one hopes the reader can easily separate the presentation of data from the author's interpretation of those data. In any case, if the reader wishes more information about certain of the data reported here or would like to see the actual tests or questionnaires or instruments used, he or she may consult the appropriate report in this Evaluation Report Series.

Setting

"Local" and "Outer Ring" Sites

As a result of rather moderate publicity of the CSMP Extended Pilot Trial, 29 school districts decided to try out the CSMP kindergarten and/or first grade materials. No conditions were placed on the number or location of pilot classes so that participating school systems were free to use the materials in as limited or extensive a way as they wanted and with whatever kinds of classes or teachers they wanted. They were required to pay the cost of producing the necessary instructional materials, to provide or allow for the collection of relevant evaluation data and to provide a coordinator for the program in their district. This coordinator was responsible for overseeing the implementation of the program including the training of pilot teachers (except as noted below) and was generally the liaison person between CSMP and the local district. The coordinator was also required to attend a one-week training workshop in the use of the CSMP curriculum.

Eight of the 29 participating school districts were located in the St. Louis area and were designated "local" as opposed to "outer ring." For them some additional conditions were imposed. First, for each first grade pilot class a suitable comparison class was to be established and accessible for the collection of various data. Second, it was understood that a considerable amount of "evaluating" would be done in these local classes, including interviews, observations, and group and individual testing. Third, all local pilot teachers were trained at one of the series of one-week summer training workshops conducted by CSMP. Any further periodic training sessions to be held during the school year were the responsibility of the local coordinators.

Thus local classes tried out the materials in fairly well controlled circumstances with standardized training, comparison classes, and considerable observation, while classes at distant sites in the "outer ring" implemented the program virtually without restriction.

Coordinators and Teacher Training

The people who became CSMP coordinators could be put into one of four categories according to their position within the school district. Five were regular kindergarten or first grade teachers who filled the double role of pilot teacher and coordinator. They usually had received between nine and 15 semester hours of college math credit. Five coordinators were elementary school principals whose collective math background was about the same as the teacher-coordinators. Five coordinators were primarily college based personnel who worked with a school district on a somewhat ad hoc basis in implementing this pilot trial. All five had advanced degrees in some area, though two had less than 15 semester hours of college math. The largest group of coordinators, 13, were district supervisory officials, usually with a title such as curriculum coordinator or curriculum consultant. This group, like the college-based coordinators, tended to have an advanced degree, although again about half (6) had less than 15 semester hours of mathematics credit.

Thus there was considerable variation in the role the coordinator ordinarily played in the school system, in the authority over pilot teachers which that role provided and in the mathematics background of coordinators. Based on rather informal impressions, it is the author's opinion that the coordinator's ability to successfully coordinate the implementation of CSMP on a pilot basis was not dependent on either his or her role in the district nor on mathematics background. Both effective and relatively ineffective coordinators were found in each of the four job categories and regardless of mathematics background.

As noted previously, all coordinators, as well as all pilot teachers in the St. Louis area, attended a one-week training workshop in the summer. The workshop time was about equally divided between the development of mathematical content and the methods used to teach the content, including the use of various instructional materials. The presentation was in lecture format for the most part with some question-and-answer sessions. Experienced teachers were available to help answer questions and specially prepared films were also used. A more complete description of the workshop is given in another Evaluation Report.*

Upon return to their local district, outer ring coordinators were responsible for the training of their own pilot teachers. The extent of this second level training varied immensely from district to district. Where the coordinator was a principal, teacher or university based person, the program was usually being piloted by 2 or 3 teachers in one school only and no formal training sessions were held prior to the beginning of school. During the school year, some coordinators held scheduled sessions at definite times while others simply got together with the teachers "when the need arose." In one or two cases virtually no training was given at all.

Where the coordinator was a district-wide supervisor of some kind, such as a "curriculum consultant" or where more than 1 school was involved, formal training sessions were usually held prior to the beginning of the school year. These sessions ranged from 4 to 20 hours in duration with an average of about 7 or 8 hours. In addition, sessions during the year tended to be more regular than for other coordinators, generally about once per month.

One reaction common to many teachers and coordinators was the difficulty in having a successful workshop when many of the instructional materials were not available. The fact that materials did not arrive in some schools in proper time for student usage, let alone for teacher training, caused some difficulties for all involved. To put it mildly, occasional annoyance was expressed.

The "Local" Setting

Teachers in the local St. Louis area were trained directly by CSMP personnel in the summer workshops described previously. (In fact the workshop sessions generally had in attendance a mixture of both local and outer ring coordinators and local teachers.) During the course of the school year inservice training for these local teachers was the responsibility of the coordinators.

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*Evaluation Report 1-C-1: Teacher Training Report

Altogether 15 kindergarten and 17 first grade teachers attended one of the summer workshops. Most had an undergraduate major in education and six of the 32 had a Master's Degree. About a third had each of five years or less teaching experience, between 6 and 10 years, and more than 10 years experience; the kindergarten teachers as a group averaging 13 years of experience and the first grade teachers about 7.5 years. Altogether, five teachers had more than nine semester hours of credit in mathematics or math education with the kindergarten teachers averaging about 5½ credits and first grade teachers about 7½ credits. Teachers were asked to rank their favorite subjects to teach. Six of the teachers ranked mathematics first, 13 ranked it second, nine ranked it third, and four ranked it fourth or lower. Thus, as a group, local teachers seem to have been fairly representative of kindergarten and first grade teachers in general, at least based on this information.

A description of the various local CSMP classes is given in Table 1 below.

Table 1
Description of Local
CSMP Pilot Classes

School District	Kindergarten			First Grade		Predominant Racial Makeup			Estimated Socio-Economic Status*					Type of Community
	Number of Teachers	Number of Classes	Mean Number of Students/Class	Number of Classes	Mean Number of Students/Class	Black	White	Mixed	Low	Low-Middle	Middle	High Middle	High	
Ferguson-Florissant	1	4	19	2	24		✓				✓			Suburban
Francis Howell	0			5	25		✓			✓	✓			Rural Suburban
Herrin	1	2	23	1	26		✓			✓	✓			Small Town
Normandy	2	4	28	4	22			✓		✓		✓		Suburban
St. Louis	4	7	23	4	32	✓		✓	✓	✓				Urban
Ladue	3	5	17	2**	23			✓				✓		Suburban
Sesser	2	3	26	3***	23		✓			✓	✓			Small Town
Affton	1	2	23	0			✓					✓		Suburban

*Based on subjective impressions of the community in which a school with pilot classes was located.

**Started teaching the program 2 months into the school year, not trained in CSMP summer workshop. Not used for comparative studies.

***Taught by the same teacher. Only first grade classes in the district. Not used for comparative studies.

Comparison Classes

Except in Ladue and Sesser, a comparison class was established for each local first grade CSMP class. The usual situation was that, within a school, one group of first graders became a CSMP class and another (or the other) group became the comparison class. The assignment of students to CSMP and comparison classes was not strictly random but in all cases the school principals attempted to make the pairs of classes as equal as possible in numbers and in compsoition of students. In four cases the CSMP class was the only first grade class in the school and the comparison class was then drawn from the nearest adjacent school.

Near the beginning of the school year the Cognitive Ability Test (Houghton-Mifflin, 1968) was administered to all CSMP and comparison first grade classes. This is a 75 item test designed to assess the development of cognitive abilities. It is the downward extension of the Lorge-Thorndike Tests and the four specific areas of cognitive skills measured by the test are, according to the test manual:

1. The ability to label or name objects or actions or to identify objects when given their use.
2. The ability to identify size, position, and quantity.
3. The ability to see relationships and to categorize or classify objects.
4. The ability to deal with quantitative relationships and concepts.

The results of this test were used to adjust end-of-year test scores for differences in entering ability, ie., as a covariate. It is referred to as the "Pretest" in this report but it was not a pretest in the sense of a pre-post administration of the same achievement test. The actual adjustments were rather small since, as measured by this test at least, the CSMP and comparison classes were very similar in entering ability. Although there were occasional differences within a pair of (CSMP-comparison) classes, the mean raw pretest score across the 16 CSMP first grade classes was 49.0 and across the 16 comparison classes was 49.2.

Thus, while assignment of students to CSMP and comparison classes was not random, pairs of classes appeared to be fairly comparable in important indices such as entering ability, academic background and socio economic status. Similarly, although the teachers were not randomly assigned to CSMP, there is reason to believe that, as a group, the comparison teachers were as skillful as the CSMP teachers. The principals of 10 schools in which both a CSMP teacher and a comparison teacher taught were asked whether or not the comparison teacher "would do as good a job teaching CSMP" as did the CSMP teacher. Nine affirmative responses were given and the tenth response was that the comparison teacher would probably do a slightly better job. These responses agree with the subjective impressions of the author, accumulated during the course of the year.

The mathematics curriculum used by the comparison teachers was whatever the school or school district was then using. This turned out to be one of four commercial math series:

Modern School Mathematics: Structure and Use, I, Duncan, Ernest R., et al, Houghton-Mifflin Co., Boston, 1967.

Elementary School Mathematics Book 1, Second Edition, Eicholz, Robert E., Addison Wesley Publishing Co., Menlo Park, Calif, 1968.

Silver Burdett Mathematics 1, LeBlanc, John F., et al, General Learning Corp., Morristown, N.J., 1973.

Essential Modern Mathematics, Primary B, Glennon, Vincent J., et al, Ginn and Co., Lexington, Mass., 1972.

These texts were very similar in overall content coverage (See p. 7 of this report).

"Outer Ring" Sites

A total of 79 teachers taught CSMP math to 98 classes in outer ring sites. A list of the numbers of participating teachers and classes for each of 21 sites is given below. There is really no way to adequately summarize the diverse ways in which the program was implemented in these outer ring sites.

"Local" School Districts	Number of Kindergarten Classes	Number of First Grade Classes	Total Number of Pilot Teachers
St. Louis, Mo.	7	4	8
Frances Howell, Mo.	0	5	5
Ferguson-Florissant, Mo.	4	2	4
Normandy, Mo.	4	4	6
Affton, Mo.	2	0	1
Sesser, Ill.	3	3	3
Herrin, Ill.	2	1	2
Ladue, Mo.	5	2	5

"Outer Ring" School Districts	Number of Kindergarten Classes	Number of First Grade Classes	Total Number of Pilot Teachers
Andrews, Texas	2	2	4
Austin, Texas	4	3	6
Bethlehem, Penn.	7	3	7
California State College, Penn.	1	1	2
Cedartown, Ga.	5	2	7
Central Washington State College, Wash.	2	1	3
Clarksville-Montgomery Co., Tenn.	1	1	2
Detroit, Michigan	8	8	14
Elizabethtown, Ky.	2	1	2
Fort Campbell Dependent Schools, Ky.	2	2	3
Lincoln County, Tenn.	2	2	4
Marquette Diocesan Office of Educ., Mich.	1	1	2
Middleton Township, N.J.	4	0	2
Nashville, Tenn.	1	1	2
New Hartford, N.Y.	2	1	2
North Allegheny, Penn.	6	3	6
Philadelphia, Penn.	0	4	4
Portland, Maine	4	2	3
Shippensburg State College, Penn.	1	1	2
Tennessee Tech. University, Tenn.	1	2	3
Whisman, Cal.	1	0	1

Results of Test Data

Tests of Standard Content: First Grade*

An analysis was made of five of the largest selling commercial math series** in order to determine what skills and concepts are generally taught to first grade students. Emphasis was placed on the actual tasks provided for students, usually in the form of practice exercises. For each content area a sequential list of tasks as they appeared in the text was compiled as well as the exercise format, sample exercises (to illustrate difficulty levels). and number of pages. The relative emphasis of various content areas is illustrated in Table 2, which was derived from the five content analyses.

Table 2

Percentage of Pages Devoted to
Each Content Area for Five
Commercial First Grade Mathematics Texts

Content Areas	Texts					
	1	2	3	4	5	Mean
Addition and Subtraction	27	40	48	38	42	39.0
Counting, Numeral Recognition	24	25	9	12	27	19.4
Order (<,>), Ordering Numerals	9	8	11	14	9	10.2
Place Value		8	8	4	5	5.0
Matching Sets of Objects	6	3	6		3	3.6
Measurement (linear, time, money)		8	9	8	7	6.4
Geometry (curves, fractional parts)	5	8	1	7	6	5.4
Miscellaneous	28*		10	18**	1	11.4

*Color, pattern recognition, classification; ie. readiness skills.

**Number line, counting by x, number properties.

*Evaluation Report 1-B-3: End-of-Year Test Data: Standard First Grade Content

**The four titles on page 5 and One by One; Harbrace Mathematics (Blue), Payne, Joseph N., et al, Harcourt Brace Jovanovich, New York, 1972.

The similarity between texts is even greater than shown by Table 2 since within content areas, the specific objectives, the item formats and the difficulty levels were very similar. Text 1 in Table 2 is different from the others in first allocating time to certain readiness skills before proceding to the usual skills and concepts and can be considered as not getting as far along in the standard first grade sequence.

Based on this analysis, 8 test scales were constructed, each one covering a different content area and generally using the kind of item format commonly found in the text books. For each local first grade CSMP and comparison class, a random half of the students took part of the test; the other half of each class took the rest of the test. Testing time was about 35-40 minutes for each half and students were tested in groups of 10 to 12 at a time.

For each test scale, the class mean was calculated for each of the 16 comparison classes. Table 3 shows the resulting data using an analysis of covariance procedure which adjusted scores for differences in entering ability as measured by the pretest. The scale labelled "Applications" is for simple word problems and the scale labelled "Measurement" is for a conglomerate of items involving telling time, coin recognition, identifying shapes, fractional parts and physical measurement. The items in the scale "Larger Numbers" were scattered throughout the two halves of the test and involved addition, subtraction, place value - familiar areas - but using numbers larger than in the other scales.

Table 3

Analyses of Class Means
for Tests of Standard Content

Subtest	Number of Items	Adjusted Mean Scores*		F Test** P less than
		CSMP	Non-CSMP	
Numeration	12	9.8	9.5	.22
Subtraction	12	7.4	8.4	.13
Order	8	5.6	5.4	.52
Applications	7	5.0	5.0	.97
Larger Numbers (A)	7	3.0	2.3	.01
Larger Numbers (B)	4	0.9	0.4	.01
Place Value	7	3.4	2.8	.06
Measurement	14	8.5	7.8	.07
Addition	13	10.2	9.9	.53

* Adjusted for entering ability based on pretest
** 1 and 14 degrees of freedom

It can be seen that CSMP classes had significantly ($p<.05$) higher scores on the Larger Number scales and the difference approached significance on two other scales, Place Value and Measurement. The only scale on which comparison classes had higher scores was the Subtraction scale and the difference was not significant.

As part of a cooperative venture these test scales were also administered to the seven CSMP classes and seven comparison classes in Region V of the Detroit School System.* The analysis described above was repeated with slightly different results. All differences were in favor of CSMP but the difference was significant on the Applications scale and approached significance ($p<.07$) on the scales Measurement and Addition.

Test of Cognitive Skills*

Three tests were constructed. They were content-free in the sense that neither CSMP nor comparison classes had been exposed to similar kinds of tasks. However, the ideas and thinking required to perform them were thought to be related to some of the concepts stressed in the CSMP program. Each test was individually administered by specially trained testers, requiring about 10 to 15 minutes per student. Each test was administered to each student in from 4 to 6 CSMP classes and to their paired comparison classes, with no class being given more than one test.

Test 1. Classification Test: A set of nine identical looking black rubber balls was used. Some were identical and some differed along dimensions of weight and/or the sound they made when picked up and shaken. Students were asked questions about these attributes including some dealing with set-subset concepts, without of course using those words.

CSMP students had some limited experiences with attribute blocks, with classifying and with working (intuitively) with sets and subsets. Thus this test was designed to measure whether or not these experiences better equipped them for classification tasks like those on this test.

Test 2. Relations Test: There were three subtests dealing with Relations.

a) Faster Than Test: Students were shown three pictures, each depicting two children running, one faster than the other. They were then given four pictures, each one a different, previously shown child, and asked to order these from fastest to slowest.

b) Coins Test: Students were shown pictures of three ficticious coins and their ordinal values (highest to lowest) and then were asked to order in value a series of pictures of various combinations of them.

*Evaluation Report 1-B-6: Summary Test Data: Detroit Schools

**Evaluation Report 1-B-5: Test Data on Some General Cognitive Skills Related to CSMP Content

c) Houses Test: Students were shown a series of pictures of houses differing from one another in number of windows (one or two), number of chimneys (one or two) and color (blue or red). They were then asked to place these pictures on a board with spaces for houses so that houses would differ from their neighbor along certain attributes.

It should be pointed out that "relations" in this context does not involve arrow diagrams but rather the commonly used concepts of more-less, same-different and faster-slower. However, experience doing "relational thinking," which might or might not involve arrow diagrams, might be expected to improve performance on these tasks.

Test 3. Analytic Reasoning: Students were shown a picture of an array of dots with non-overlapping loops containing between them all the dots. They were told a "secret dot" was in a loop which held a certain number of dots. This process was repeated, sometimes twice, with the same dots but new placement of loops and the student asked to name the unique dot which satisfied all these conditions.

This test required students to go through a process of elimination in first reducing the set of possible dots to a smaller set and to then compare that smaller set with one or more smaller sets to determine which dot was common to these smaller sets. That is, the student had to shift his attention back and forth between different subsets of dots. It may be conjectured that this ability to focus one's attention on certain members of a set of objects is enhanced by the CSMP program.

The analysis of class means, with adjustment for pretest scores, was carried out in the usual way. The results are given in Table 4.

Table 4

Analysis of Class Means
for Three Tests of Cognitive Skills

Test	Number of Items	Adjusted Mean Scores*		F Ratio:** P less than
		CSMP	Non-CSMP	
Classification	20	14.34	13.78	.44
Relational Thinking	15	10.92	10.19	.13
Analytic Reasoning	9	3.25	2.75	.16

* Adjusted for pretest scores
** 1 and 5, 1 and 9, and 1 and 7 degrees of freedom respectively

The differences were not significant on any of the tests, although CSMP classes had higher mean scores in each case, particularly the Relational Thinking and Analytic Reasoning tests.

The three subtests of the Relational Thinking test were also administered to two CSMP and two comparison classes in Detroit* and the resulting difference in means scores was in favor of the CSMP classes and significant at the .05 level.

Kindergarten Test**

Two 16-item tests were constructed to measure student achievement of 12 of the 14 objectives of the CSMP kindergarten program. Eight of these 14 objectives dealt with rather traditional concepts such as counting, numerals, and shapes, while the other four objectives were related to the more unique aspects of CSMP, such as arrow diagrams and Venn diagrams.

The tests were administered to a total of 12 CSMP kindergarten and 8 non-CSMP kindergarten classes in two local districts as shown below in Table 5. One form of the test was administered to a random half of each test. In District A, the non-CSMP classes were, with one exception, from the same schools as the CSMP classes, while in District B they were from different schools. Thus the comparative data shown in Table 5 may not be particularly valid.

Table 5

Analysis of Mean Scores
on CSMP Kindergarten Test

	Test Form A				Test Form B			
	CSMP		Non-CSMP		CSMP		Non-CSMP	
	n	Mean	n	Mean	n	Mean	n	Mean
District A	68	13.1	68	11.6	68	13.8	68	12.6
District B	45	13.7	21	13.2	39	13.9	18	12.7

*Evaluation Report 1-B-6: Summary Test Data: Detroit Schools

**Evaluation Report 1-B-4: End-of-Year Test Data: CSMP Kindergarten Content

An item analysis of the test items was carried out according to objective tested and the mean percent correct across students computed separately for CSMP and for non-CSMP students. The starred entries are those objectives on which the mean percent correct for items related to that objective differed by more than 10.

Table 6

Item Analysis of Kindergarten Test
According to Objective Tested

Objectives Common to Most Kindergarten Programs	Number of Items Testing Objective(s)	Mean Percent Correct: CSMP Students	Mean Percent Correct Non-CSMP Students
Objectives 1 and 6: Identifying Shapes	3	94	95
Objectives 3 and 4: Counting Objects	4	95	92
Objective 5: Identifying Numerals	6	96	95
*Objectives 7 and 8: Story Problems (with pictures)	5	90	79
Objective 11: Longer, Shorter	2	98	98
*Objective 12: Rote Counting	4	80	65
Objectives More Unique to CSMP			
*Objectives 9 and 10: Arrow Diagrams (Numeric)	3	40	25
*Objective 13: Arrow Diagrams (Non-Numeric)	3	61	35
Objective 14: Venn Diagrams	2	58	56

Test of CSMP First Grade Content: Mid-Year*

This test was administered to each local CSMP first grade class at about the time the class reached lesson A140, which was sometime in February or March. The test was constructed from an analysis of the student workbooks and of the CSMP Content Resumé, a sequential development of 15 content areas as they appear in the first grade lessons.

Three tests were constructed to test two content areas each. Then each student took one of the three tests, the assignment within classes based on pretest score to ensure that "equal" thirds of each class took each of the three tests. The six content areas tested were the following:

I. Number-numeral: Counting the number of a given set of objects, writing numerals in order, producing a given number of dots, matching numerals to sets.
II. Addition: Completing addition stories (equations) given appropriate string pictures, completing addition tables.
III. Relations: Drawing dots or arrows for spirals (+1, +2), drawing arrows to show "greater than" relationships.
IV. Order: Using correct symbol of <, > or = to show correct relationship of two numbers or pictures of things.

V. Minicomputer: Strictly speaking this is not a content area as such, but is intended as a pedagogical tool for teaching a variety of ideas. However, students did spend considerable time with the Minicomputer and it is an important part of the curriculum, however classified.

VI. Multiplication: Various embodiments of multiplication and doubling appear, though sometimes very briefly, in ten of the first 136 lessons. Workbook practice, however, is very light. Thus it was understood from the outset that mastery of any of them could not be expected. Of all areas tested only the multiplication items were not expected to be well answered.

A summary of the data from the six content areas is presented in Table 7. The tests were relatively homogeneous as indicated by the high KR 20's. The correlations with the CAT are in the expected range, indicating that the test scores are moderately related to performance on the pretest.

Table 7

Summary Data from Mid-Year
Test of CSMP First Grade Content

Content Area	Number of Items	Mean Percent Correct	KR20	Correlation with Pretest
Relations	24	72	.92	.60
Multiplication	6	37	.71	.41
Number-Numeral	39	90	.92	.52
Addition	15	79	.93	.50
Minicomputer	32	81	.96	.54
Order	15	90	.94	.48

Test of CSMP First Grade Content: End-of-Year*

A total of 12 content areas was tested. The items were constructed in a manner similar to that of the Mid-Year Test, using student workbooks and an analysis, in the Content Resumé, up to lesson A240. Two points should be noted. First, content on which students had already shown a high degree of proficiency in the Mid-Year Test was not retested. Second, because of the spiral nature of the CSMP curriculum, the test items of any given content strand exhibited a wide range of difficulty levels, ranging from very easy items on which virtually all students were expected to be at mastery level, to items testing content much further along in the strand which students had very little experience with and which only the better ones might get.

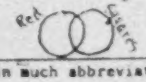
*Evaluation Report 1-B-2: End-of-Year Test Data: CSMP First Grade Content

The test was administered to all local CSMP first grade classes in May. Within each class, half of the students were randomly assigned to take six of the subtests and the other half of the students took the other six subtests.

Table 8, below, summarizes the results of the testing. For each content area, a sample item has been provided and the ratings given by the evaluation staff to the performance of students on that content area. This has been done on a quartile by quartile basis according to the scores on that particular subtest, that is, the performance of that quarter of the students who scored highest on the subtest has been rated separately, as has the second highest scoring quarter of students, etc. The ratings were subjective in nature and took into account, besides the percentages correct for students, the number of lessons and amount of workbook practice devoted to that content, the level of difficulty of the test items, and the importance of that content area in preparing for new material. For example, a higher level of performance was expected on items testing skill in one-digit addition, which is necessary for students who will shortly be learning the concept of "carrying," than on items testing skill in one-digit multiplication which is a highly spiralled topic presented in many embodiments and with little emphasis on skill building in the first grade.

Table 8

Summary Data from End-of-Year
Test of CSMP First Grade Content

Subtest	Sample Item*	Number of Items	Mean % Correct	Rating of Performance** According to Subtest Scores				
				Top Quarter of Students	Second Quarter of Students	Third Quarter of Students	Bottom Quarter of Students	Overall
Multiplication	3 x 4 = __	10	54	VG	VG	I	I	A
Integers	2 + 3 = __	8	66	VG	VG	A	I	A
Rationals (a)	Shade ½ of each cake cut in half	11	82	VG	VG	VG	A	VG
Rationals (b)	½ x 4 = __	5	49	VG	VG	VP	VP	A
Counting Money	5¢ 5¢ 5¢ 1¢ 1¢ = __¢	5	62	VG	VG	A	VP	A
Minicomputer	Use M.C. for 16 + 45 =	17	51	VG	A	A	I	A
Relations		27	60	VG	A	A	I	A
Addition	Complete addition table	15	77	VG	VG	VG	A	A
Subtraction	10 − 7 = __	13	81	VG	VG	VG	A	VG
Order <, >, =	3−2 __ 3+2	6	64					A
Probability	Select "Fair" spinner	3	54		Not Rated			A
Venn Diagrams	Place a red square 	1	39					

*Items shown in much abbreviated form.

**VG-Very Good, A-Adequate, I-Inadequate, VP-Very Poor

Although there is some concern about those subtests which received poor ratings for the lower scoring students, and although there were large differences in performance between highest and lowest scoring students on some subtests (not shown in Table 8), it is concluded, for the present, that students' overall performance on this test was adequate. This statement is made with reservations, at least until one can determine whether or not the low scoring students, as they progress through the curriculum, show improved performance on these tasks.

For each subtest the class means for the 14 local first grade classes who took the test were adjusted for entering ability. Rather consistent interclass differences were then found across many of the subtests and these differences could not be accounted for in any significant way by any of the following 6 variables (derived from observational or questionnaire data):

a) degree of teacher adherence to the program
b) teacher skill in CSMP recommended techniques
c) student involvement or attentiveness
d) number of lessons completed
e) teacher attitude towards program
f) student attitude towards "math"

Teacher Reactions to CSMP

Teacher Questionnaires*

Two questionnaires were sent to all pilot teachers. The Midyear Questionnaire was sent in January and 79% of the teachers responded. The End-of-Year Questionnaire was sent in June; the response rate was 56%. The lower figure for June may be due to the lateness with which the questionnaires were sent out. Since the later questionnaire was more extensive than at mid-year as well as repeating virtually all the earlier items and since later responses on identical items tended to be similar or only slightly more positive than earlier responses, only the data from the End-of-Year Questionnaire is summarized here. It was also true that based on an analysis of mid-year returns, the later respondent group was very representative of the larger group who responded at mid-year.

Since the questionnaire was quite lengthy, and requested several free-response answers, it is difficult to adequately summarize the data in a few paragraphs. Thus only what are considered to be the major findings are given in point form below. For the most part, all groups of teachers, local and outer ring, kindergarten and first grade, responded very favorably to the program and liked to teach it. Very few questions drew many negative responses.

a) CSMP was overwhelmingly preferred to previously used mathematics programs on student interest, achievement and overall quality. Out of a total of 181 responses to these three questions only 2 were negative and 11 were neutral.
b) Of 39 responding teachers who were planning to continue teaching next year, 36 said they would continue with CSMP.
c) Teachers were asked to write a free-response evaluation of the program. Seventy-seven percent were judged favorable, 9% unfavorable.
d) Forty-eight of the fifty-five responding teachers listed more areas of increased student accomplishment than areas of decreased accomplishment.
e) Outer ring teachers, trained by their own coordinators, responded less positively to certain items than did local CSMP-trained teachers. They found more difficulty in teaching certain content, progressed less far in the sequence and rated lower the "appropriateness of CSMP for low ability students."
f) Teachers tended to estimate the expected "life" of various instructional materials to be shorter than recommended by CSMP, particularly demonstration materials.
g) Teachers were asked a series of questions about each of five major content areas. For these five areas, teachers felt that they had "few" or "no problems" in presenting the material, that their students "liked the topic moderately" or were "enthusiastic about it," but in about 30% of the cases, stated that there were "difficulties which required extra time to resolve.
h) About one-third of the teachers felt that "ease of managing the various materials in a CSMP classroom" was "poor" and many of these teachers agreed with the statement that "student workbooks and worksheets should be bundled as a set for each student." Kindergarten teacher, however, felt that the materials would be managed adequately.

*Evaluation Reports 1-C-1: Teacher Training Report and 1-C-3: Mid-Year Data from Teacher Questionnaires

i) The first grade lesson sequence contains 308 lessons and it is recommended by CSMP that teachers complete at least the first 240. Many teachers did not reach lesson 240 and the median was only 248 for local teachers and 210 for outer ring teachers. Roughly half of the teachers thought the sequence was "too rapid," one-third taught math twice a day and the median number of minutes of daily math instruction was 45. Fifty-four teachers thought that the time required for daily preparation, compared to their previous math program, was either "less" or "about the same" or "more now but would be about the same after a year's experience." Only seven teachers thought the time was "more and would continue to be."

j) Twenty-six percent of the respondents thought CSMP was less or much less appropriate for low ability students than was their previously used math text, while 36% thought it was about the same and 38% thought it more or much more appropriate.

Classroom Observations*

Each first grade classroom was observed at least four times in order to:

a) quantify the faithfulness of the program's implementation in the various classrooms vis-a-vis the recommendations of CSMP.
b) provide a qualitative description of the program in operation with a variety of teacher styles and classroom settings.

Implementation Form

An implementation form was developed which contained a nine point scale yielding separate scores on three variables: the degree to which the presented lesson adhered to the lesson plan, teacher skill in using certain teaching techniques, and student reactions. Also recorded at the time of each visit were the teacher's comments during a brief interview at the end of the lesson, the observer's notes, and the time taken to teach the lesson.

In the 59 classroom observations for which the implementation form was used, adherence to program was very high. For example, in 95% of the observations materials were used as intended and no content errors were observed, and in 80% of the observations the lesson plan was followed with reasonable care.

In the area of teacher skill in using certain teaching techniques, three of the items dealt with "mechanics and preparation," "focus of the lesson" and "questionning technique." For these three, 66% of the ratings were "good" and 8% were "poor." However, on a fourth item, "pace of lesson," about one-third of the lessons were rated as "too slow." This item also showed the most variation among teachers.

*Evaluation Report 1-C-2: Observations of CSMP First Grade Classes

In the area of student reactions, there were two items, dealing with student attentiveness and student involvement. For both of these items 12% of the ratings were "low" and 30% were "high."

Thus in general the program was being implemented as intended. For only one teacher could the faithfulness of implementation be considered even questionable. The only significant problem seemed to be that the pace of the lesson often seemed rather slow. Independently, it was noted that the required time exceeded the recommended time by an average of 8 minutes (where lessons were generally from 12 to 20 minutes in recommended length).

Summary of Observer Notes and Interviews

a) In general, most of the teachers observed implemented the program in an acceptable manner. Although problems were encountered by some, most teachers were able to cope.
b) The program appeared to vary as the makeup of the classes and teacher styles varied. Thus, the program does not seem to be either "teacher free" or "student free."
c) The program seemed quite adaptable to differing classroom situations. That is, although the program varied from class to class, it appeared workable in most cases.
c) Teacher attitudes were generally quite positive toward the program throughout the year. Generally, the positive reaction appeared to be based on an enthusiasm for the mathematical ideas in the program and on the reactions of the children.
d) The students in the classes appeared able to perform in a reasonable fashion during the lessons. The children in most classes seemed at least moderately interested and involved in the lessons.
e) Many teachers had trouble sticking to the recommended pace and this appeared to be more dependent on teacher style than on class ability level. Teachers who moved along briskly seemed to encounter fewer problems and to be happier about the course.
f) Many teachers expressed concern that the program was too hard for low ability students, though most agreed that their slow students were learning as much as ever. In the observers' opinion, this reaction may be due in part to the spiral nature of the curriculum and the real problem may lie in teachers' ability to deal with a wide range of abilities when using a spiral curriculum.

Interviews with Kindergarten Teachers*

Near the end of the school year a structured interview of 20-30 minutes duration was conducted with each of the 15 local kindergarten teachers. The interview was conducted at the end of a mathematics lesson, which was observed by the interviewer. Bearing in mind that these observations were not very extensive, the observer-interviewer noted:

"First, in all classes there was evidence that, as a group, the children seemed able to do the lessons. Most of them appeared neither lost nor bored.... Second, all of the teachers appeared to be implementing the program in a reasonably faithful manner...(they) seemed to be generally able to get the concepts across to the children and to actively involve the children in the lessons."

*Evaluation Report I-C-5: Interviews with CSMP Kindergarten Teachers

Each teacher was asked a total of 25 questions dealing with 10 aspects of the program. These aspects and the responses to them are summarized very briefly below.

1. General Impressions: Most teachers said their overall attitude toward the program had become more favorable since beginning the program. Twelve of the 15 teachers were very positive towards the program, the other three were either neutral or only slightly positive.

2. Program Comparisons: A total of 29 comparative statements were made and 25 of these were favorable to CSMP vis-a-vis other kindergarten programs. The features of CSMP most commonly cited as distinctive were the higher level of student enthusiasm and the challenging nature of the content.

3. Best and Worst Aspects of CSMP: Forty-four responses were given for "best aspects," with 21 different aspects noted. The most common responses were related to games, rods and A-blocks. Nineteen responses were given for "worst aspects" the most common responses being that CSMP was "hard for slow children" and that arrow diagrams were too difficult for children to draw.

4. Child Attitudes: Four times as many responses were given for "things children liked" as for things children disliked" about CSMP. Most teachers indicated children's attitudes were more favorable towards math.

5. Student Learning: All teachers considered that overall learning was adequate, though about half indicated that some "slow" children had difficulties. Two-thirds of the teachers thought children learned more this year.

6. Parent Reactions: For all teachers, parent reaction was limited and generally quite favorable towards the program.

7. Quality of Teacher Lesson Guide: There was wide disagreement on this issue, particularly the rather unstructured nature of lesson sequence, which some teachers saw as a strength and others as a weakness.

8. Changes and Supplements to the Program: About half the teachers provided supplementary materials or lessons on elementary counting and number concepts. Other changes or supplements to the program were minor and isolated.

9. Management of Materials: Thirteen of the fifteen teachers indicated there was little or no problem in managing materials.

10. Teacher Preparation: All teachers agreed that some sort of workshop should be provided for beginning CSMP teachers. Several stated that a better overall picture of the program and where it was going should be provided, and that teachers should be instilled with more confidence in their own ability to teach the program.

Teacher Logs*

All pilot teachers were asked to keep a daily record of the lessons taught and the time required and their rating for each lesson. They were also asked to make weekly free-form responses they thought relevant regarding some general aspects of CSMP.

Lesson Ratings: Each lesson was to be rated "Good," "Fair," or "Poor." Table 9 shows the number of ratings put into each category when the ratings were summed across teachers and lessons.

Table 9

Number of "Good," "Fair" or "Poor" Ratings

	Total Number of Ratings	Number of Times Lesson Rated "Good"	Number of Times Lesson Rated "Fair"	Number of Times Lesson Rated "Poor"
First Grade Teachers	7,244	6,125	1,037	82
Kindergarten Teachers	2,573	2,109	407	57

At both the first grade and kindergarten levels, over 85% of the lessons received "Good" ratings from most (>70%) of the teachers and only one lesson at each level did not receive a majority of "Good" ratings. The first grade content areas generally having the highest rated lessons were Integers, Geometry, Probability, Workbook Lessons and Estimation, while lessons having to do with Combinatorics and, for local teachers, Subtraction and Mental Arithmetic, were lowest rated.

Teachers were asked to tell what they did for students who entered their class during the course of the year. Listed about equally often were: individual help by teacher, help from other students, and catching up with earlier worksheets and workbooks. Teachers rarely responded to the question regarding specific problems encountered.

Responses to questions regarding changes of sequence, the use of Free Days, the use of supplementary materials, suggestions for changes and anecdotes were very sparse and are not summarized here.

*Evaluation Report 1-C-6: Analysis of Teacher Logs

Other Issues

Cost

Estimating the cost, on a per pupil per year basis, of adopting a curriculum is a notoriously difficult enterprise. There are several reasons for this. Items advertised as "additional materials" may be sometimes just that, and not at all necessary to a classroom teacher; at other times they are really integral parts of the curriculum, such as testing materials in an individualized program. Some materials are consumable, others are not but their length of service is not consistent from district to district, depending on the kind of usage they get. Occasionally duplicating masters are offered in which case a school must bear labor and paper costs. Teacher training may or may not be necessary depending on teacher experience. Teacher aids may be advisable on a ratio of between 1 to 20 or 1 to 200 students. There may be savings in cost for large numbers of classes at any grade level, with demonstration materials for example, or by the use of a specialist teacher. Some curricula require considerable expenditure of time on the part of a district "coordinator" or "curriculum consultant."

The complexity of any of the above items varies from curriculum to curriculum and from district to district. In attempting to calculate the costs associated with CSMP a further confusing issue is the fact that present costs of producing materials are based on relatively small scale production methods and with rather unsophisticated methods of packaging. Conversely, the usual costs of advertising and selling are not now built into the price of materials. In fact the amount of money paid by pilot sites for materials is virtually the exact amount presently required to produce and ship these materials.

There are three basic kinds of materials required for CSMP: student workbooks and worksheets, teachers' guides (primarily sets of lesson plans) and other materials, either classroom demonstration materials or student manipulatives. Of these three, the student workbooks and worksheets are by far the most expensive and are also the only consumable items. Table 10 shows present cost figures, for starting up the program and for maintaining it after the first year, for kindergarten through second grades. Maintenance costs are calculated by dividing the cost of each article by the expected number of years of life. Costs are presented on a per pupil basis and a class size of 30 students is assumed. Optional materials are not included; they would add only about $.25 per year per student. The figures were computed from information in the CSMP Order Form (1974-75).

Table 10

Per Pupil Per Year Costs
of K-2 CSMP Materials
For Current Production Methods

	Kindergarten		First Grade		Second Grade	
	Start Up	Maintenance	Start Up	Maintenance	Start Up	Maintenance
Student Materials (Worksheets and Workbooks)	$.92	$.92	$3.93	$3.93	$3.72	$3.72
Other Materials (Teacher Guides and Manipulatives)	$.32	$.08	$1.95	$ .85	$1.58	$ .46
Total	$1.24	$1.00	$5.88	$4.78	$5.20	$4.18

In order to get an estimate of costs for other elementary level mathematics curricula, the most recent catalogs of most of the leading publishers were analyzed. The estimates given in Table 11, page 23, are based on that information. Where optional materials are available, they are not included in the cost unless they are clearly an integral part of the program. In fact there is a bewildering array of multi-media supplements available, some quite expensive which could easily form the basis of a math program. Duplicating masters are occasionally available in place of or as well as consumable materials. Student texts are sometimes in hard cover, accompanied by a work tablet, and sometimes sold as a consumable text-workbook. Sometimes it is not clear what materials are necessary for starting up a program and what are necessary for maintenance of it. In making the calculations for Table 11, a class size of 30 has been assumed and maintenance costs have assumed a life span of four years for all non-consumable materials. This may be a generous estimate for some materials and stingy for others.

Thus, the entries in Table 11 are only estimates and many factors have been taken into account. Except for some of the more expensive programs, the estimates do not include the cost of any manipulatives or supplementary materials.

Bearing in mind the fact that the CSMP costs are based on present production methods for pilot study use, while costs for other programs are based on catalog prices, some comparisons can be made. It can be seen that at the kindergarten level CSMP is cheaper than most other programs. At the first grade level about two-thirds of the programs listed, those consisting of a basic consumable workbook possibly augmented by practice exercises in one form or another, cost between $2 and $4 per pupil per year for both start up and maintenance. Thus CSMP is more expensive than most and cheaper than some. About the same thing is true at the second grade, though CSMP costs are down some from first grade while some other programs are slightly higher than in first grade.

Table 11

Estimates of Per Pupil Per Year
Cost for Various Mathematics Programs
at First Grade Level

Publisher and Text	First Grade		Kindergarten	
	Start Up Costs	Maintenance Costs	S U C	M C
Encyclopaedia Brittanica				
Math Workshop	$2.20	$1.70	$1.25	$1.25
Silver Burdett				
S.B. Mathematics System	8.70	5.10	5.00	3.00
Modern Math Through Discovery	2.60	2.50	2.50	1.85
Science Research Associates				
SRA Mathematics Learning System	3.60	3.40	1.50	1.50
Ginn and Company				
An Applied Approach	3.60	3.30	3.45	2.00
Individualized Mathematics System	4.60	2.10		
Essential Modern Mathematics	5.10	3.15	2.50	.60
Scott Foresman				
Mathematics Around Us	3.15	3.10	1.70	1.70
Basic Mathematics Program	2.50	2.25	2.50	2.50
Rand McNally				
Developing Mathematical Processes	11.30	4.40	6.60	3.30
Schoolmath	3.10	3.00	1.35	1.35
Houghton-Mifflin				
Modern School Mathematics	3.90	3.60	1.90	.50
Mathematics for Individual Achievement	3.80	3.50	1.90	.50
New Century Educational Corporation				
IPI Mathematics	7.85*	7.85		
Laidlaw Brothers				
Understanding Mathematics Program	2.20	2.05	1.50	1.50
New Laidlaw Mathematics Program	2.45	2.20	1.50	1.50
Cuisenaire Company of America				
Opening Doors in Mathematics	7.80	5.70		
American Book Company				
Mathematics Target System	2.90	2.70	1.75	1.75
Mathematics in Action	2.55	2.50		
Addison-Wesley				
Investigating School Mathematics	4.12	4.00	1.65	1.55
Elementary School Mathematics	2.70	2.60	1.65	1.55
Harcourt Brace Jovanovich				
Harbrace Mathematics				
Elementary Mathematics Series	3.55	2.60	2.72	2.10
	2.70	1.90	2.00	1.50

*Exclusive of associated personnel costs.

Another cost which an adopting school district must carry is that of training teachers. No dollar figures are given here because that cost is too dependent on the role of the coordinator, the size of the adoption, the extent of teacher training desired, and many other factors. It would seem reasonable however, that these costs would be moderate since it is a one-time (per teacher) training workshop, which might be carried out by an already in-place district-wide coordinator and might require only 2 or 3 days pre-service and perhaps an hour per month during the first year. The important consideration is probably the availability of a coordinator whose responsibility is district wide; if such a person is available to a district, training costs should not be high.

External Review*

The Mathematical Association of America, in response to a request on behalf of CSMP by Dr. Robert Dilworth, Chairman, CSMP Evaluation Panel, supplied a list of names of persons deemed suitable to evaluate the work of CSMP. Any person on the list who had been previously involved with the program, or who was known to have expressed any kind of opinion about the program, or who was known to be unavailable as a reviewer was excluded from consideration. Five persons were selected and asked to review the materials. One was unable to accept and his place taken by another person recommended by the MAA. The five reviewers were the following:

Professor Shirley Hill
University of Missouri at Kansas City

Professor Dan E. Christie
Bowdoin College

Professor Leonard Gillman
University of Texas at Austin

Professor George Springer
Indiana University

Professor Sherman Stein
University of California at Davis

The reviewers were sent all K-2 materials except manipulatives (some second grade workbooks were not available), sample third grade materials, sample fourth grade lesson plans, and some background explanatory materials. Each was asked to give his "opinions as to the soundness and relevance of the mathematical content...The format for your review is open for you to respond as you see fit."

*Evaluation Report 1-A-2: External Review of CSMP Materials

Dr. Shirley Hill agreed to serve as chairman of the group and to summarize the set of reviews. Her summary review follows, in toto.

"If this sample of mathematician's opinion is in any way representative then I cannot help but comment that the mathematical community is a long way from any consensus concerning what mathematics is important and what should be taught. (The possibility that there could be agreement on how it is taught is so remote as to exclude hope.) The difficulty of summarizing the five reports is exacerbated by the apparent fact that the reviewers' perceptions of their roles and the purpose of their evaluations differed greatly. The reports seem to be addressed to different audiences and vary widely in degree of specificity, in focus and in the framework of time and vision (farsighted, shortsighted, nearsighted, hindsight, foresight, the "now," the future, the past, etc.) within which any value judgment is imbedded. Thus I strongly urge any reader of this summary at least to skim each of the individual reports.

"The overall impression of the materials was favorable; three reviewers expressed quite favorable evaluations directly, the reaction of another was mixed, and the impression of the fifth cannot be said to be favorable, though it was not explicitly negative.

"One point of general agreement in the reports was on the soundness of the mathematical content. The material is seen to be mathematically sound without any egregious technical or conceptual errors. There were differences of opinion concerning matters of preference and taste in the development of the mathematical ideas.

"It was at least implicit in every report that it was impossible to separate completely in an evaluation of this kind, matters of mathematics and matters of pedagogy. Certainly most of the differences in preference concerning the way the mathematics was presented had little to do with mathematical soundness but rather related to questions of learning, development, concept formation and the like. Many of these are empirical questions. I think that it is fair to say that most of the very specific comments and specific criticisms concern psychological and pedagogical issues.

"An example of a curricular element which is a mix of mathematical and pedagogical issues is the use of the minicomputer. This is the single point of complete agreement among all reports. There is too much reliance on the minicomputer. Three reviewers vehemently opposed its use as an aid altogether; the other two seriously question its value in light of the very great investment of time. (Both of these reviewers agree that the effectiveness of the device with respect ot computational skills is an empirical question) All five reviewers are dubious to very negative on the minicomputer's mixture of a binary and decimal base.

"Are the materials innovative, current, timely? Comments ranged from 'it is more of the same' to 'the material is refreshingly full of new ideas.' The majority were of the opinion that the materials were timely and current and in many instances excitingly new. One reviewer found much new material of which he could approve but too much 'old' material from the era of 'new math.' One found some 'good sections' but little mathematics and much 'obsessive ritual.'

"The question of relevance is tricky, as everyone knows. 'Relevance' has no meaning except in the context of one's objectives, values, indeed one's philosophy. I can only infer that there are differences among the reviewers in the philosophical basis of their views of mathematics - what it is and what it does. Thus it is impossible to summarize the comments relating to perceived relevance of the material. There simply is no constant base for the opinions expressed. Certainly I can ascertain no consistent set of criteria for relevance.

"Let me offer some examples of these differences. One reviewer sees the authors of the materials as 'oriented to pure mathematics' and working in the 'format of the past twenty years,' while another feels that the extent of 'student's participation' and spontaneity is encouraging, apparently viewing the materials as having moved beyond 'the precocious discussions of systems and structure' of the past decade.

"One reviewer sees too much carryover of material from the 'new math' (I defy anyone to provide a clear-cut definition of that unfortunate term) and views such material as faddish while another, believing in the need for more historical perspective in distinguishing trends from fundamentals, compliments the authors on maintaining a balanced program that is timely and relevant today without discarding all the achievements of recent years.

"The majority of reviewers saw the materials as modern, relevant on today's trends in mathematics and its applications with potential for developing competent future mathematical users and problem-solvers.

"I will end by mentioning some specific things mentioned in more than one review. All reviewers praised the inclusion of extensive study of probability. Most liked the material on relations and functions, on graphing and arrow diagrams, on combinatorics.

"Three reviewers specifically pointed to the 'spiral' development and saw this as a positive feature. These three reviewers also believed the balance between concepts and applications was good. Two specifically pointed out that the activities stimulate active problem-solving and logical reasoning.

"Most reviewers were critical of the material on sets, set operations, and Venn diagrams. Two opposed the material on the properties of arithmetic operations. Two felt there should be more reliance on manipulative, physical materials.

"As mentioned earlier, all reviewers were negative (in varying degrees) about the minicomputer."

Continued Usage, Second Year of Pilot Trial

One very good indication of satisfaction with CSMP in a pilot site is the decision that the district makes regarding continued usage of the program after a year's trial. Table 12 reflects these decisions.

Table 12

Number of Pilot Classes, By District
1973-74 and 1974-75

	Role of Coordinator*	1973-74		1974-75	
		Number of Classes	Number of Schools	Number of Classes	Number of Schools
Discontinued	T	1	1	0	0
	U	3	1	0	0
	T	4	2	0	0
	C	4	1	0	0
Maintenance or Moderate Expansion (≤ 5 Additional Classes in 74-75)	C	2	1	2	1
	P	2	1	3	1
	T	2	1	3	1
	U	2	1	4	1
	U	2	1	5	2
	C	3	1	3	1
	U	3	1	3	1
	P	3	1	5	1
	T	3	1	7	1
	C	4	1	4	1
	P	5	3	10	3
	P	6	2	9	2
	T	7	1	11	1
Large Expansion (≥ 9 Additional Classes in 74-75)	C	4	4	27	
	C	6	2	22	4
	U**	6	2	36	13
	C	6	1	46	9
	C	7	3	16	7
	C	7	1	86	7
	C	8	3	27	6
	P	9	1	18	7
	C	10	4	37	11
	C	11	8	36	17
	C	16	7	26	6
New Sites	C			2	1
	C			22	14

*T: Teacher, P: Principal, U: University Based Person,
C: District Wide Coordinator or Consultant

**This coordinator worked with two different school districts.

When looking across districts at the increase in number of pilot classes from 1973 to 1974, it is apparent that there was a high degree of satisfaction with the program. In September 1973, 138 classes began using CSMP materials. The next year, this number had more than tripled to 448, exclusive of classes begun at the two new sites.

It is interesting to look at these decisions as a function of the coordinator's usual role within the school system:

a) Teachers. Five CSMP pilot teachers also took on the role of the coordinator. In two of these districts the program was discontinued, and in none of the other three was there a large increase in the number of classes (nine or more additional classes) or even a new start at a second school.

b) Principals. In four of the five cases in which the coordinator was a principal, the numbers of classes using CSMP in 1974 were about the same or slightly higher than the number in 1973. In none of these four cases was a start made at a new school. In the fifth case, there was an expansion from nine classes in one school to 18 classes in seven schools. However, all 18 classes are kindergarten classes, the three first grade teachers from last year having discontinued the program with no new first grade classes added.

c) College Based Personnel. In four of the five cases where the coordinator was based at a local college, the program was tried in only one school (three of these were lab schools). For these four sites, either the program was discontinued or there was very moderate expansion. In the fifth case where the program was begun in two schools, there was a large expansion from six to 36 classes.

d) District Wide Coordinators. Where the coordinator had district-wide responsibilities as Curriculum Consultant or Curriculum Coordinator or some such title, there was generally a much more dramatic increase in the number of pilot classes. In all seven cases where the program was begun in more than one school, and in two of the six cases where it was begun in exactly one school, there was a large expansion of CSMP in the district.

Thus it appears that the coordinators who achieve the most impact for CSMP are those with full-time district-wide responsibilities. It is also true that when the program is started in a single school it does not usually get used beyond that school; where the program is used originally in more than one school, there is likely to be a large expansion the next year. One suspects this situation is similar with other new programs and in other subject areas. Table 13 illustrates these trends for CSMP.

Table 13

Instances of Large Expansion
from 1973-74 to 1974-75

	Number of Cases 1973-74	Number of Large Expansions 1974-75
By Position of Coordinator		
Teacher	5	0
Principal	5	1
University Based	5	1
District-Wide Coordinator	13	9
By Number of Schools, 73-74		
1	17	3
2	4	2
3	3	2
>3	4	4

Discussion

Before summarizing the major findings of the first year of the Extended Pilot Trial it is worth recalling some of the provisos noted earlier. In the first place, pilot school districts selected the program on a voluntary basis and made their own decision as to the number of pilot classes and which teachers would teach those classes. The teachers volunteered in some cases and were "designated" in other cases. Although there is some evidence, at least for classes in the local area, that pilot teachers were not too unlike other teachers in their respective districts, the fact remains that they were a selected or self-selected group of teachers. They may also have been rather enthusiastic about teaching a new curriculum with lots of new things in it. On the other hand, these teachers were required to learn much new material: A whole new set of lesson plans; considerable use of arrow diagrams, the Papy Minicomputer, and Venn diagrams; and the spiral approach. First grade teachers were teaching students who did not have CSMP in kindergarten. Materials were occasionally late in arriving or arrived in disorderly condition. These factors must have caused some difficulties and at least dampened somewhat any potential invalidity due to the Hawthorne effect or the selection factor.

In the author's opinion, the above considerations were not of major importance and the conclusions drawn below are accurate descriptions of the program in normal use. During the second year of the pilot study a wider range of teachers will be using the materials and most of the 1973-74 pilot teachers will be using the materials the second time through. Thus many of the key issues will indeed be investigated under more normal conditions. It may very well be true that the existence of an industrious coordinator, with district-wide responsibilities and with experience in helping and training teachers, is much more important than all of the above factors.

The major impressions that the author of this report has gained from this first year of the Extended Pilot Trial are the following:

1. The program was very well liked. Across districts which used CSMP in 1973-74, there has been a three fold increase in the number of pilot classes for 1974-75 (p.26) and these districts have had to bear the responsibility for paying for the materials and training teachers. Teacher attitudes towards the program were favorable and they overwhelmingly preferred it to their previous mathematics program along dimensions of student interest, achievement and overall quality (p.16 and 18). This endorsement was much less overwhelming in the particular area of appropriateness of CSMP for low ability students where 38% of the teachers thought it more appropriate than their previous mathematics program, while 26% thought it less appropriate (p.17).

2. The program is reasonably practical. The present per pupil cost of CSMP is higher than the cost of the consumable workbooks offered in many math series and is lower than some of the more recent series with "individualized" materials or with extensive manipulatives (p.22). Teacher training time varied from a day to a week sometime before the beginning of school, and this was usually augmented by periodic sessions during the year (p.2). The only teachers who were observed carefully were those trained in a one week session and they appeared

to be implementing the program successfully in a variety of settings and in the intended manner (p.16). Materials were generally manageable, though some teachers expressed difficulty in keeping track of everything (p.16). Most teachers took about the usual amount of time (45 minutes per day) but many were not able to complete even the minimum prescribed lessons during the course of the year (p.17).

3. The intrinsic merit of the program was viewed with mixed reactions (p.25). A five member panel of experts independently reviewed the available materials and gave widely divergent opinions about the program. A box score of these reviews might be: favorable overall with roughly three for, one against, and one mixed. All reviewers agreed that the mathematical content is sound, but there was also agreement that there is too much reliance on the minicomputer.

4. Student learning was excellent in some cases, adequate in others. CSMP classes generally outperformed comparison classes on a series of test scales designed, without regard to the content of CSMP, to measure student achievement of the skills and concepts traditionally covered in first grade mathematics (p.7). CSMP classes had higher scores than non-CSMP classes, though not significantly so, on three "content-free" tests (p.9). These tests consisted of tasks which were unfamiliar to all the first grade students tested and which were thought to be related to certain CSMP "ways of thinking." On a test of the specific content of the first grade CSMP program, administered only to CSMP students, student achievement was judged to be adequate overall although a significant proportion of the students scored poorly on specific subtests (p.13). Judgments regarding the degree of "success" attained on this latter test were difficult to make because of the lack of available standards that could be applied.